

CS-03-021

January 5, 2004

To: Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Fr: George O. Saile, Reg. No. 19,572
28 Davis Avenue
Poughkeepsie, N.Y. 12603

Subject: | Serial No. 10/688,047 10/17/03 |
Chung Foong Tan et al.
END OF RANGE (EOR) SECONDARY DEFECT
ENGINEERING USING SUBSTITUTIONAL
CARBON DOPING
| _____ |

INFORMATION DISCLOSURE STATEMENT

Enclosed is Form PTO-1449, Information Disclosure Citation
In An Application.


The following Patents and/or Publications are submitted to
comply with the duty of disclosure under CFR 1.97-1.99 and
37 CFR 1.56.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being
deposited with the United States Postal Service as first class
mail in an envelope addressed to: Commissioner for Patents,
P.O. Box 1450, Alexandria, VA 22313-1450, on January 27, 2004.

Stephen B. Ackerman, Reg.# 37761

Signature/Date

 1/27/04

In the article "Optimum Halo Structure for Sub-0.1um CMOSFETs", Wen-Kuan Yeh et al., IEEE Transaction on Electron Deivces, Vol. 48, No. 10, October 2001, pp. 2357-2362, optimized halo structures for sub-0.1um CMOS-FETs are evaluated.

In the article "Antimony Assisted Arsenic S/D Extension Engineering for Sub-0.1um nMOSFETs: A Novel Approach to Steep and Retrograde Indium Pocket Profiles," Howard C.H. Wang et al., IEDM 2001, proposes a novel process whereby Antimony Assisted Arsenic S/D Extension is employed to realize a steep and retrograde indium pocket profile for sub-0.1um nNOSFETs.

In the article "Effects of end-of-range dislocation loops on transient enhanced diffusion of indium implanted in silicon," T. Noda et al., Journal of Applied Physics, Vol. 88, No. 9, November 2001, pp. 4980-4984, transient enhanced diffusion of indium implanted in silicon is studied in the presence of the end-of-range (EOR) damage layer.

The article "Enhanced electrical activation of indium coimplanted with carbon in a silicon substrate," H. Boudinov et al., Journal of Applied Physics, Vol. 86, No. 10, pp. 5909-5911, November 15, 1999, discusses low dopant activation.

The articles "Indium transient enhanced diffusion," P.B. Griffin et al., Applied Physics Letters, Vol. 73, No. 20, pp. 2986-2988, Nov. 16, 1998, and "Evolution of end-of-range damage and transient enhanced diffusion of indium in silicon," T. Noda, Journal of Applied Physics, Vol. 91, No. 2, pp. 639-645, Jan 15, 2002, discuss transient enhanced diffusion (TED).

Reports have shown that with the incorporation of carbon into the amorphous-crystalline silicon interface of the dopant implant profile, EOR secondary defects can be removed. This interface is an area or region at the tail end of the implant profile which maintains its crystalline property, but it is saturated with the dopant impurity. This is discussed in the articles "Elimination of secondary defects in preamorphized Si by C+ implantation," Satoshi Mishikawa et al., Applied Physics Letters, 62(3), Jan. 18, 1993, pp. 303-305 and "Removal of end of range defect in Ge+ pre-amorphized Si by carbon ion implantation," Peng-Shiu Chen et al., Journal of Applied Physics, Vol. 85, No. 6, March 15, 1999, pp. 3114-3119.

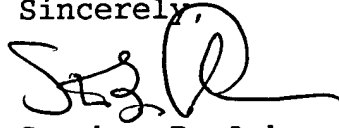
"Suppression of dislocation formation in silicon by carbon implantation," T.W. Simpson et al., Applied Physics Letters, 67(19), Nov. 6, 1995, pp. 2857-2859, discusses substitutional carbon was shown to act as a sink for silicon interstitials formed, preventing the clustering of silicon interstitials, thereby preventing EOR secondary defect formation.

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U.S. Patent 6,541,829 to Nishinohara et al., "Semi-conductor Device and Method of Manufacturing the Same," discloses an indium halo implant.

U.S. Patent 6,514,886 to U'Ren, "Method for Elimination of Contaminants Prior to Epitaxy," teaches an RPCVD method prior to epitaxy.

Sincerely,

A handwritten signature in black ink, appearing to read 'S. B. Ackerman', with a large, stylized 'Q' or '0' at the end.

Stephen B. Ackerman,
Reg. No. 37761

Form PTO-1449

Doctor Number (Optional)

Application Number

CS-03-021

10/688,047

Logitcan1

Chang Foong Tan et al.

Filing Date

10/17/03

Group Art Unit

INFORMATION DISCLOSURE CITATION IN AN APPLICATION

(Use several sheets if necessary)

U. S. PATENT DOCUMENTS

[illegible]

FOREIGN PATENT DOCUMENTS

[illegible]

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

- "Optimum Halo Structure for Sub-0.1 μm CMOS FETs", Wen-Kuan Yeh et al., IEEE Trans. on Electron Devices, Vol. 48, No. 10, Oct. 2001, pp. 2357-2362.
- "Antimony Assisted Arsenic S/D Extension Engineering for Sub-0.1 μm nMOSFETs: A Novel Approach to Steep and Retrograde Indium Pocket Profiles", Howard C.H. Wang et al., IEDM 2001.

EXAMINER

DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

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Appetition Number

10 | 688,047

Chang Foong Tan et al.

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FOREIGN PATENT DOCUMENTS

[illegible]

OTHER DOCUMENTS (Including Author, Title, Date, Portion, Pages, Etc.)

- "Indium transient enhanced diffusion", P.B. Griffin et al., Applied Physics Letters, Vol. 73, No. 20, pp. 2986-2988, Nov. 16, 1998.
- "Evolution of end-of-range damage and transient enhanced diffusion of indium in silicon", T. Noda, Journal of Applied Physics, Vol. 91, No. 2, pp. 639-645, Jan. 15, 2002.
- "Suppression of dislocation formation in silicon by carbon implantation", T.W. Simpson et al., Appl. Physics Letters, 67 (19), Nov. 6, 1995, pp. 2857-2859.

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Application Number

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10/688,047

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Chung Foong Tan et al.

Filing Date

10/17/03

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INFORMATION DISCLOSURE CITATION IN AN APPLICATION

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U. S. PATENT DOCUMENTS

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FOREIGN PATENT DOCUMENTS

[illegible]

OTHER DOCUMENTS (Including Author, Title, Date, Portion or Pages, Etc.)

-	"Elimination of secondary defects in preamorphized Si by C ⁺ implantation", Satoshi Mishikawa et al., <u>Applied Physics Letters</u> , 62(3), Jan. 18, 1993, pp. 303-305.
-	"Removal of end of range defect in Ge ⁺ pre-amorphized Si by carbon ion implantation", Pang-Shiu Chen et al., <u>Jrnl of Applied Physics</u> , Vol. 85, No. 6, March 15, 1999, pp. 3114-3119.
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